

# Notice of Allowability

Application No.

10/807,738

Examiner

Marie R. Yamnitzky

Applicant(s)

THOMPSON ET AL.

Art Unit

1774

## -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to AF amendment filed Sept. 10, 2007 and telephonic interview on Sept. 18, 2007.
2. ☒ The allowed claim(s) is/are 1-3, 5-21, 28, 29, 31-33, 35-39, 41-57, 64, 65, 67-69 and 71-73.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☐ All    b) ☐ Some\*    c) ☐ None    of the:
  1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
  - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
    - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
  - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

### Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08),  
Paper No./Mail Date \_\_\_\_\_
4. ☐ Examiner's Comment Regarding Requirement for Deposit  
of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☒ Interview Summary (PTO-413),  
Paper No./Mail Date 09182007.
7. ☒ Examiner's Amendment/Comment
8. ☐ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_.



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(C-N) is a substituted or unsubstituted cyclometallated ligand, and (C-N) is different from at least one other ligand attached to the metal;

each of  $R_8$ ,  $R_{10}$ , and  $R_{12}$  to  $R_{14}$  is independently selected from hydrogen, alkyl, alkenyl, alkynyl, alkylaryl, CN,  $CF_3$ ,  $NO_2$ , halo, aryl, heteroaryl, substituted aryl, substituted heteroaryl, or a heterocyclic group;

additionally or alternatively, any two adjacent substituted positions together form, independently, a fused 4- to 7-member cyclic group, wherein said cyclic group is cycloalkyl, cycloheteroalkyl, aryl, or heteroaryl, and wherein the 4- to 7-member cyclic group may be optionally substituted with a substituent independently selected from hydrogen, alkyl, alkenyl, alkynyl, alkylaryl, CN,  $CF_3$ ,  $NO_2$ , halo, aryl, heteroaryl, substituted aryl, substituted heteroaryl, or a heterocyclic group;

m has a value of at least 1;

n has a value of at least 1; and

$m + n$  is the maximum number of ligands that may be attached to the metal.

2. (Original) The compound of claim 1, wherein n is 2.

3. (Original) The compound of claim 2, wherein each ligand is organometallic.

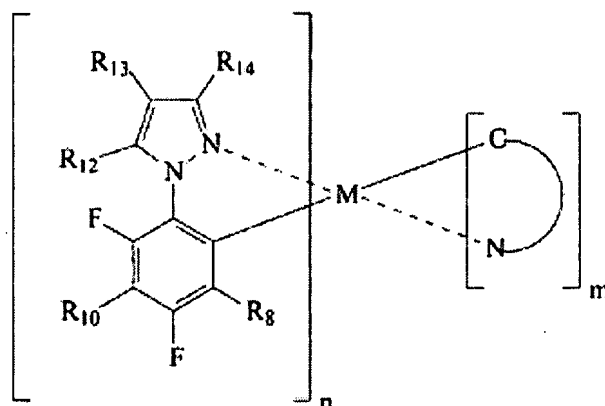
4. (Canceled)

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5. (Previously Presented) The compound of claim 1, wherein M is selected from the group consisting of Ir, Pt, Pd, Rh, Re, Ru, Os, Tl, Pb, Bi, In, Sn, Sb, Te, Au, or Ag.

6. (Original) The compound of claim 5, wherein M is Ir.

7. (Currently Amended) A compound, having the structure:



wherein

M is Ir;

(C-N) is a substituted or unsubstituted cyclometallated ligand, and (C-N) is different from at least one other ligand attached to the metal;

each of R<sub>8</sub>, R<sub>10</sub>, and R<sub>12</sub> to R<sub>14</sub> are H;

m has a value of at least 1;

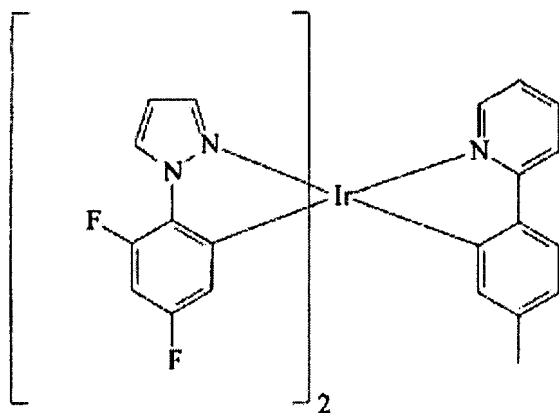
n has a value of at least 1; and

m + n is the maximum number of ligands that may be attached to the metal.

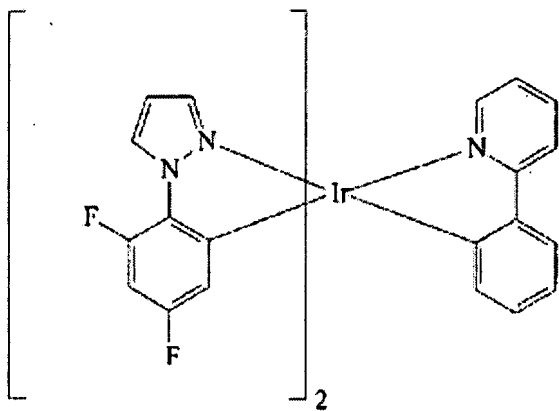
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8. (Original) The compound of claim 7, wherein n is 2 and m is 1.

9. (Previously Presented) The compound of claim 8, having the structure:

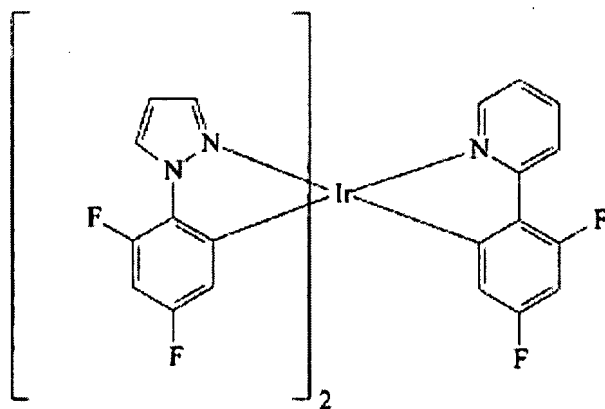


10. (Previously Presented) The compound of claim 8, having the structure:

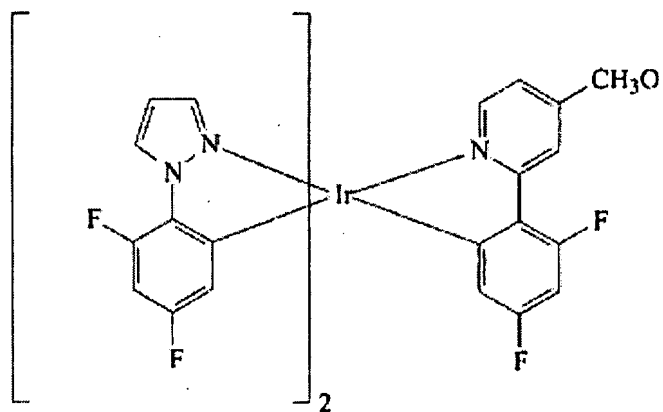


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11. (Previously Presented) The compound of claim 8, having the structure:

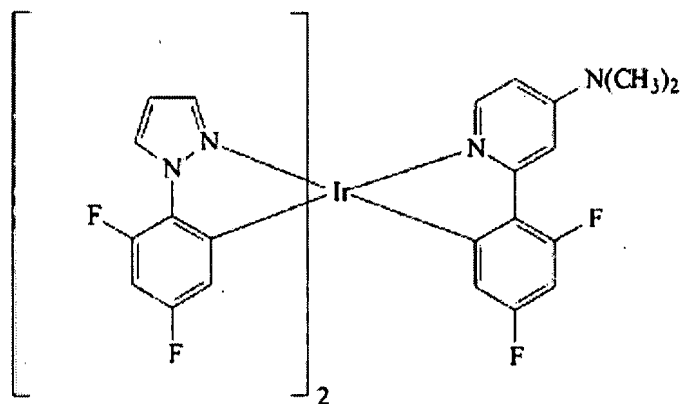


12. (Previously Presented) The compound of claim 8, having the structure:

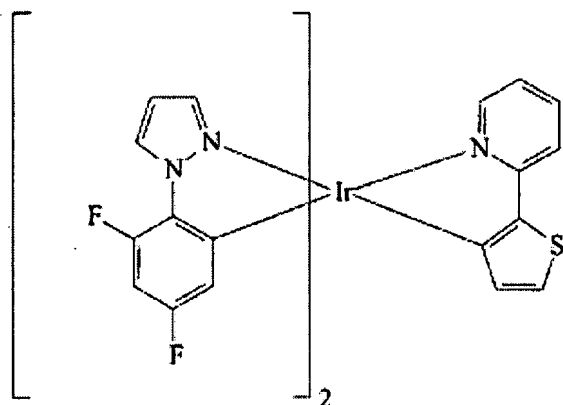


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13. (Previously Presented) The compound of claim 8, having the structure:



14. (Previously Presented) The compound of claim 8, having the structure:

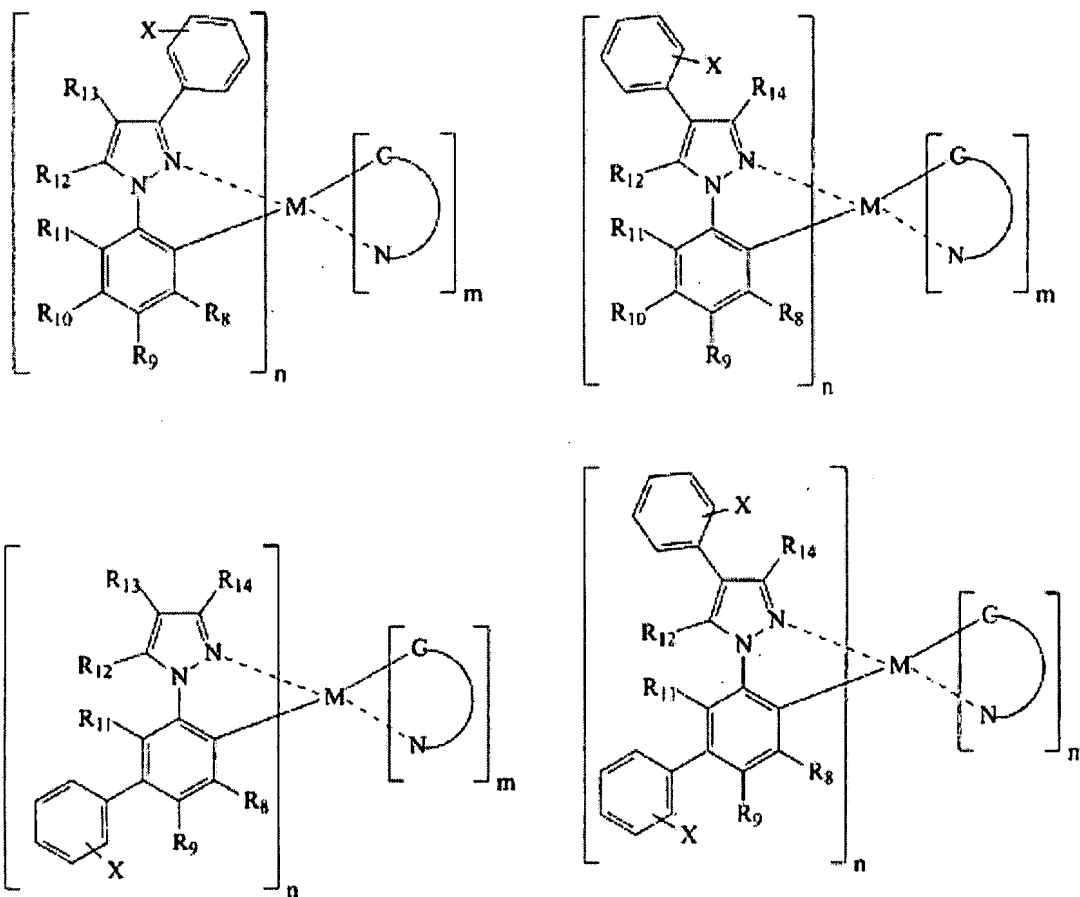


15. (Previously Presented) The compound of claim 1, wherein at least one of  $R_8$ ,  $R_{10}$ ,  $R_{12}$  to  $R_{14}$ , and a substituent of (C-N) is independently selected from substituted or unsubstituted phenyl, naphthyl, or pyridyl.

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16. (Previously Presented) The compound of claim 15, wherein at least one of  $R_8$ ,  $R_{10}$ ,  $R_{12}$  to  $R_{14}$ , and a substituent of (C-N) is phenyl.

17. (Currently Amended) The compound of claim 16, wherein the compound has a structure selected from the group consisting of:



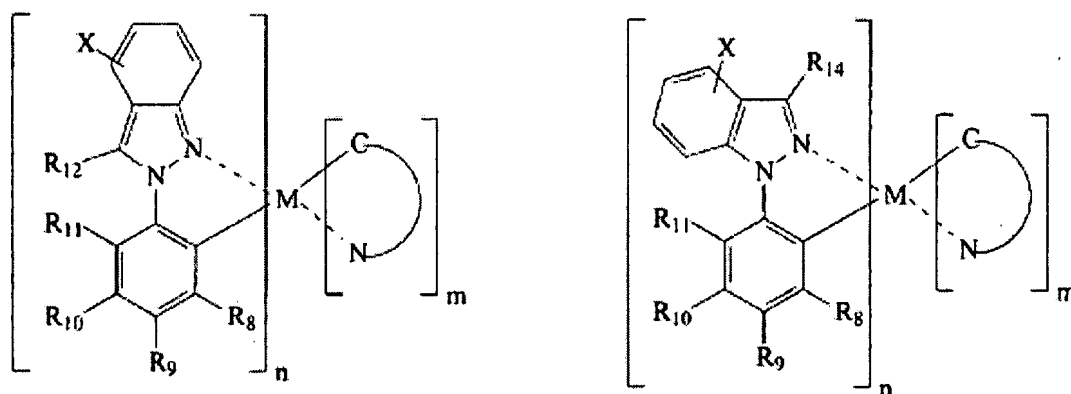
wherein  $X$  is independently selected from hydrogen, alkyl, alkenyl, alkynyl, alkylaryl,  $CN$ ,  $CF_3$ ,  $CO_2R$ ,  $C(O)R$ ,  $NR_2$ ,  $NO_2$ ,  $OR$ , halo, aryl, heteroaryl, substituted aryl, substituted heteroaryl, or a heterocyclic group;



additionally or alternatively, any two adjacent substituted positions together form, independently, a fused 4- to 7-member cyclic group, wherein said cyclic group is cycloalkyl, cycloheteroalkyl, aryl, or heteroaryl, and wherein the 4- to 7-member cyclic group may be further substituted by substituent X; and

R<sub>9</sub> and R<sub>11</sub> are F.

18. (Currently Amended) The compound of claim 1, wherein the compound has a structure selected from the group consisting of:



wherein X is independently selected from hydrogen, alkyl, alkenyl, alkynyl, alkylaryl, CN, CF<sub>3</sub>, ~~CO<sub>2</sub>R~~, ~~C(O)R~~, ~~NR<sub>2</sub>~~, NO<sub>2</sub>, ~~OR~~, halo, aryl, heteroaryl, substituted aryl, substituted heteroaryl, or a heterocyclic group;

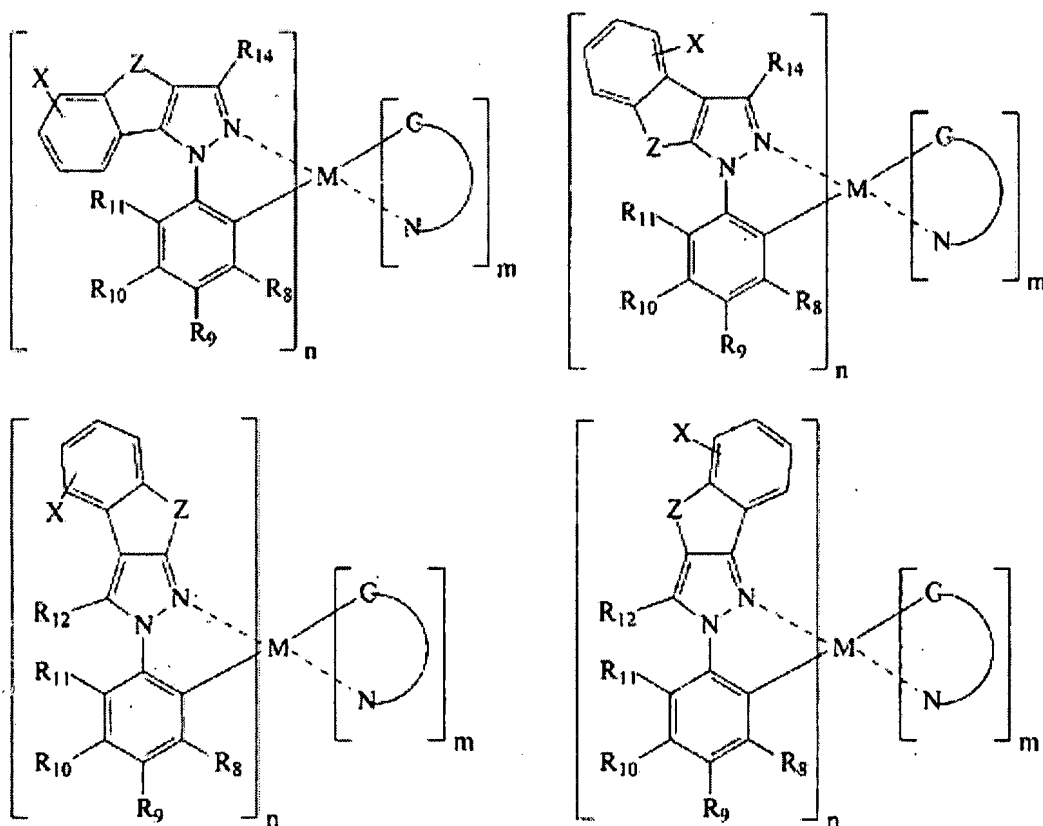
additionally or alternatively, any two adjacent substituted positions together form, independently, a fused 4- to 7-member cyclic group, wherein said cyclic group is cycloalkyl, cycloheteroalkyl, aryl, or heteroaryl, and wherein the 4- to 7-member cyclic group may be further substituted by substituent X; and

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Z is selected from  $\text{CH}_2$ ,  $\text{CRR}$ ,  $\text{NH}$ ,  $\text{NR}$ ,  $\text{O}$ ,  $\text{S}$ ,  $\text{SiR}$

$\text{R}_9$  and  $\text{R}_{11}$  are F.

19. (Currently Amended) The compound of claim ~~18~~ 1, wherein the compound has a structure selected from the group consisting of:



wherein  $X$  is independently selected from hydrogen, alkyl, alkenyl, alkynyl, alkylaryl,  $\text{CN}$ ,  $\text{CF}_3$ ,  $\text{NO}_2$ , halo, aryl, heteroaryl, substituted aryl, substituted heteroaryl, or a heterocyclic group;

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additionally or alternatively, any two adjacent substituted positions together form, independently, a fused 4- to 7-member cyclic group, wherein said cyclic group is cycloalkyl, cycloheteroalkyl, aryl, or heteroaryl, and wherein the 4- to 7-member cyclic group may be further substituted by substituent X;

Z is selected from -CH<sub>2</sub>, -CRR, -NH, -NR, -O, -S, -SiR wherein R is independently selected from hydrogen, alkyl, alkenyl, alkynyl, alkylaryl, CN, CF<sub>3</sub>, NO<sub>2</sub>, halo, aryl, heteroaryl, substituted aryl, substituted heteroaryl, or a heterocyclic group; and

R<sub>9</sub> and R<sub>11</sub> are F.

20. (Original) The compound of claim 1, wherein the compound is a phosphorescent emissive material.

21. (Previously Presented) The compound of claim 1, wherein at least one ligand is a phosphorescent emissive ligand in the compound at room temperature, and at least one ligand is not a phosphorescent emissive ligand in the compound at room temperature.

22.-27. (Canceled)

28. (Previously Presented) The compound of claim 21, wherein the ligand emissive in the compound at room temperature has a triplet energy corresponding to a wavelength that is at

least 80 nm greater than the wavelength corresponding to the triplet energy of the ligand that is not emissive in the compound at room temperature.

29. (Previously Presented) The compound of claim 28, wherein the emissive ligand is organometallic.

30. (Canceled)

31. (Previously Presented) The compound of claim 28, wherein the emissive ligand has a triplet energy corresponding to a wavelength of 500-520 nm.

32. (Previously Presented) The compound of claim 28, wherein the emissive ligand has a triplet energy corresponding to a wavelength greater than 590 nm.

33. (Previously Presented) The compound of claim 28, wherein each ligand is organometallic.

34. (Canceled)

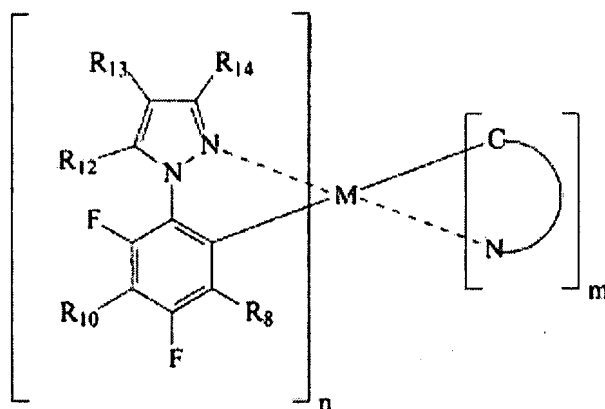
35. (Previously Presented) The compound of claim 33, wherein the emissive ligand has a triplet energy corresponding to a wavelength of 500-520 nm.

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36. (Previously Presented) The compound of claim 33, wherein the emissive ligand has a triplet energy corresponding to a wavelength greater than 590 nm.

37. (Previously Presented) An organic light emitting device, comprising:

- (a) an anode;
- (b) a cathode; and
- (c) an emissive layer disposed between and electrically connected to the anode and the cathode, the emissive layer comprising a compound having the structure



wherein

M is a metal having an atomic weight greater than 40;

(C-N) is a substituted or unsubstituted cyclometallated ligand, and (C-N) is different from at least one other ligand attached to the metal;

each of R<sub>8</sub>, R<sub>10</sub>, and R<sub>12</sub> to R<sub>14</sub> is independently selected from hydrogen, alkyl, alkenyl, alkynyl, alkylaryl, CN, CF<sub>3</sub>, NO<sub>2</sub>, halo, aryl, heteroaryl, substituted aryl, substituted heteroaryl, or a heterocyclic group;

additionally or alternatively, any two adjacent substituted positions together form, independently, a fused 4- to 7-member cyclic group, wherein said cyclic group is cycloalkyl, cycloheteroalkyl, aryl, or heteroaryl, and wherein the 4- to 7-member cyclic group may be optionally substituted with a substituent independently selected from hydrogen, alkyl, alkenyl, alkynyl, alkylaryl, CN, CF<sub>3</sub>, NO<sub>2</sub>, halo, aryl, heteroaryl, substituted aryl, substituted heteroaryl, or a heterocyclic group;

m has a value of at least 1;

n has a value of at least 1; and

m + n is the maximum number of ligands that may be attached to the metal.

38. (Original) The device of claim 37, wherein n is 2.

39. (Original) The device of claim 38, wherein each ligand is organometallic.

40. (Canceled)

41. (Previously Presented) The device of claim 37, wherein M is selected from the group consisting of Ir, Pt, Pd, Rh, Re, Ru, Os, Tl, Pb, Bi, In, Sn, Sb, Te, Au, or Ag.

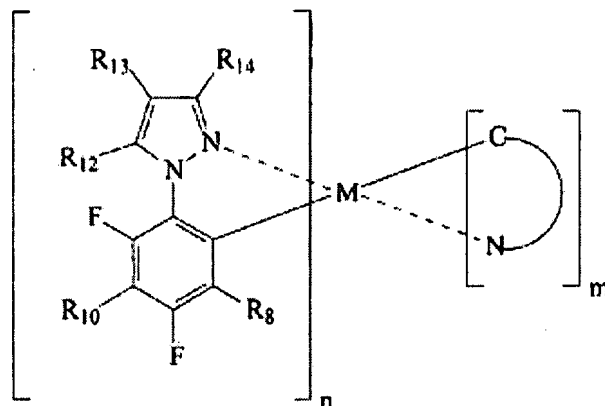
42. (Original) The device of claim 41, wherein M is Ir.

43. (Currently Amended) An organic light emitting device, comprising:

(a) an anode;

(b) a cathode; and

(c) an emissive layer disposed between and electrically connected to the anode and the cathode, the emissive layer comprising a compound having the structure



wherein

M is Ir;

(C-N) is a substituted or unsubstituted cyclometallated ligand, and (C-N) is different from at least one other ligand attached to the metal;

each of R<sub>8</sub>, R<sub>10</sub>, and R<sub>12</sub> to R<sub>14</sub> are H;

m has a value of at least 1;

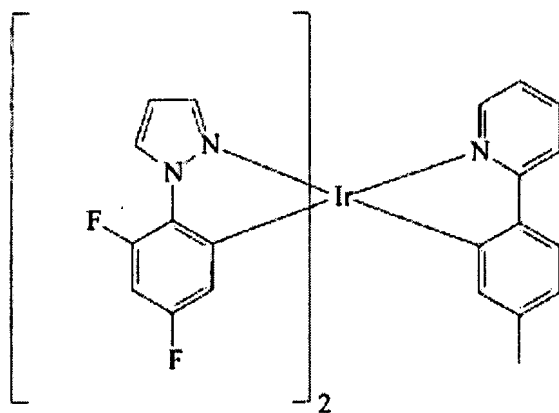
n has a value of at least 1; and

m + n is the maximum number of ligands that may be attached to the metal.

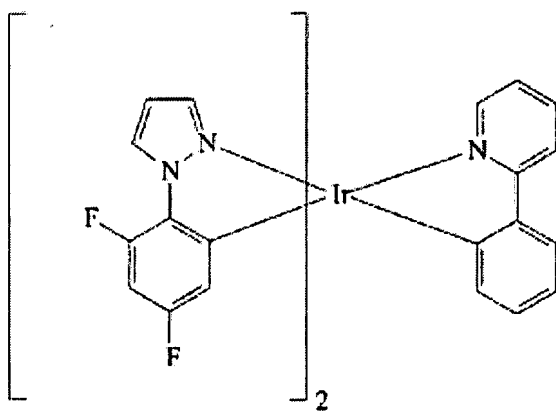
44. (Original) The device of claim 43, wherein n is 2 and m is 1.

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45. (Previously Presented) The device of claim 44, wherein the compound has the structure:



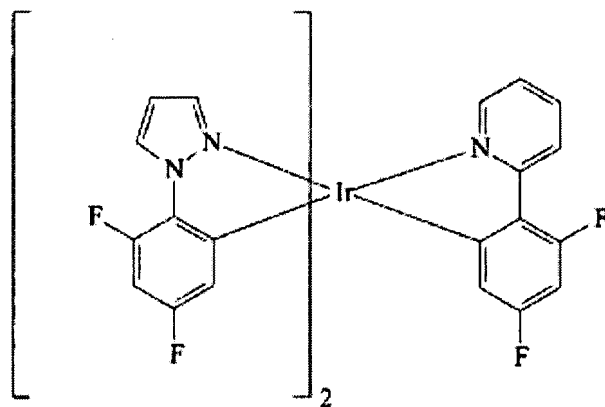
46. (Previously Presented) The device of claim 44, wherein the compound has the structure:



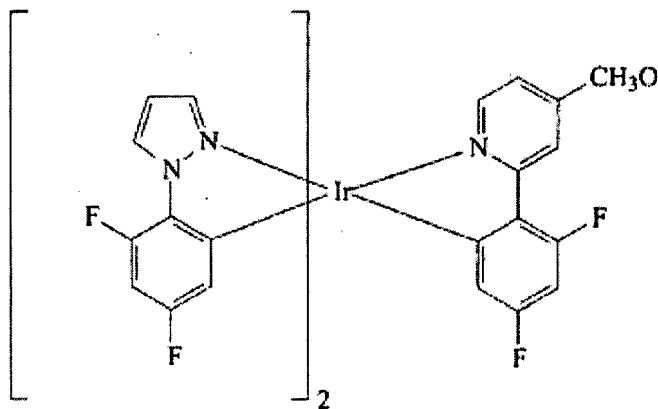


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47. (Previously Presented) The device of claim 44, wherein the compound has the structure:

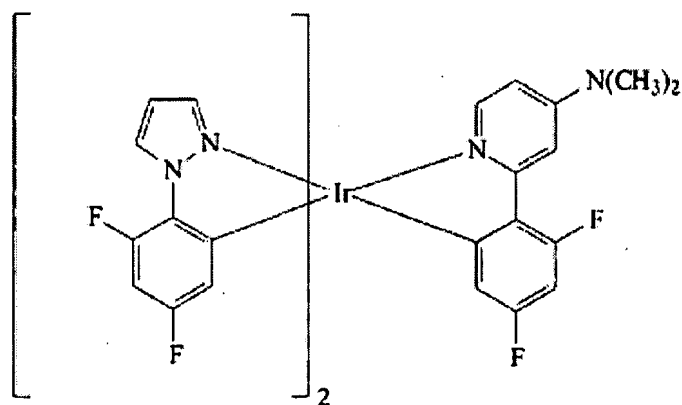


48. (Previously Presented) The device of claim 44, wherein the compound has the structure:

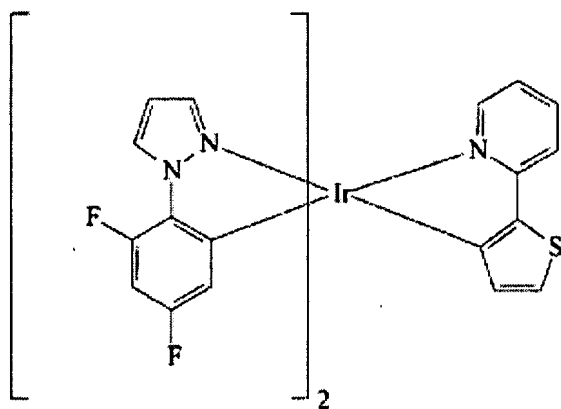


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49. (Previously Presented) The device of claim 44, wherein the compound has the structure:



50. (Previously Presented) The device of claim 44, wherein the compound has the structure:

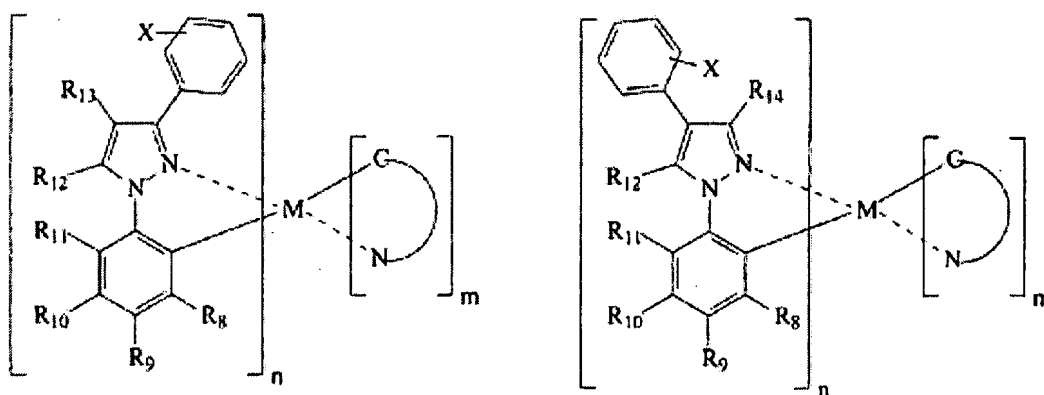


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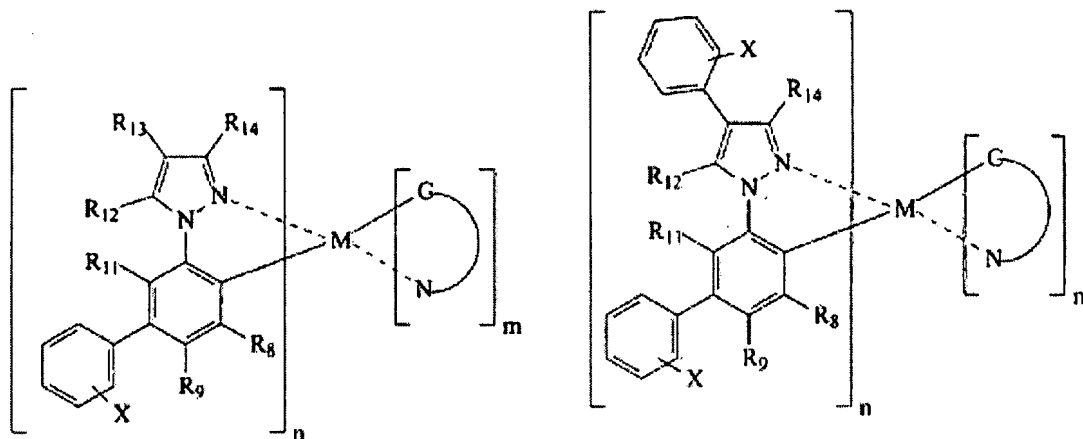
51. (Previously Presented) The device of claim 37, wherein at least one of  $R_8$ ,  $R_{10}$ ,  $R_{12}$  to  $R_{14}$ , and a substituent of the (C-N) is independently selected from substituted or unsubstituted phenyl, naphthyl, or pyridyl.

52. (Previously Presented) The device of claim 51, wherein at least one of  $R_8$ ,  $R_{10}$ ,  $R_{12}$  to  $R_{14}$ , and a substituent of the (C-N) is phenyl.

53. (Currently Amended) The device of claim 52, wherein the device compound has a structure selected from the group consisting of:



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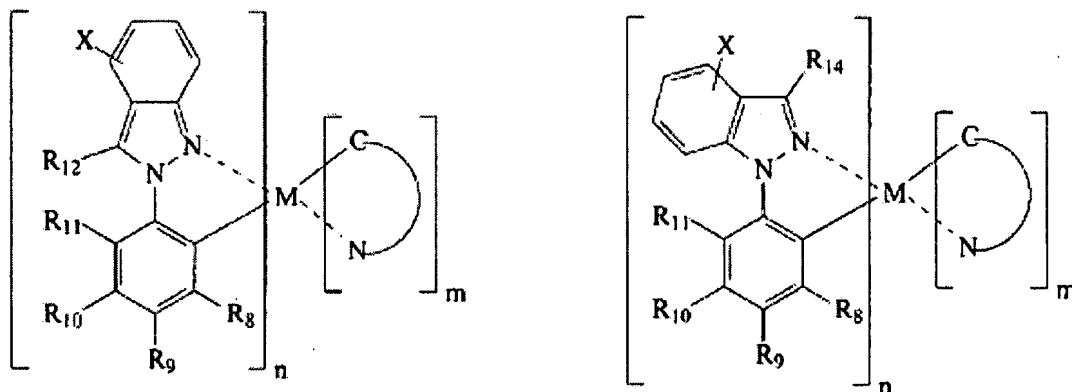
wherein X is independently selected from hydrogen, alkyl, alkenyl, alkynyl, alkylaryl, CN, CF<sub>3</sub>, CO<sub>2</sub>R, C(O)R, NR<sub>2</sub>, NO<sub>2</sub>, OR, halo, aryl, heteroaryl, substituted aryl, substituted heteroaryl, or a heterocyclic group;

additionally or alternatively, any two adjacent substituted positions together form, independently, a fused 4- to 7-member cyclic group, wherein said cyclic group is cycloalkyl, cycloheteroalkyl, aryl, or heteroaryl, and wherein the 4- to 7-member cyclic group may be further substituted by substituent X; and

R<sub>9</sub> and R<sub>11</sub> are F.

54. (Currently Amended) The device of claim 37, wherein the ~~device~~ compound has a structure selected from the group consisting of:

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wherein X is independently selected from hydrogen, alkyl, alkenyl, alkynyl, alkylaryl, CN, CF<sub>3</sub>, ~~CO<sub>2</sub>R~~, ~~C(O)R~~, ~~NR<sub>2</sub>~~, NO<sub>2</sub>, ~~OR~~, halo, aryl, heteroaryl, substituted aryl, substituted heteroaryl, or a heterocyclic group;

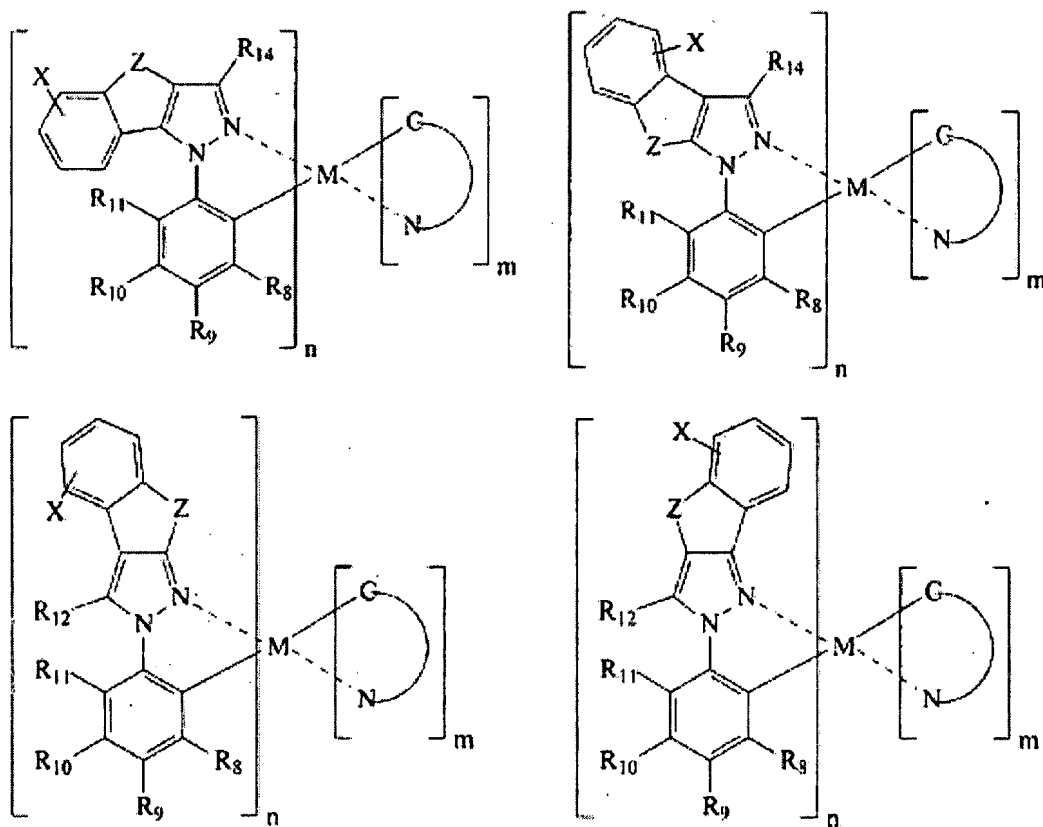
additionally or alternatively, any two adjacent substituted positions together form, independently, a fused 4- to 7-member cyclic group, wherein said cyclic group is cycloalkyl, cycloheteroalkyl, aryl, or heteroaryl, and wherein the 4- to 7-member cyclic group may be further substituted by substituent X; and

Z is selected from ~~CH<sub>2</sub>~~, ~~CRR~~, ~~NH~~, ~~NR~~, ~~O~~, ~~S~~, ~~SiR~~

R<sub>9</sub> and R<sub>11</sub> are F.

55. (Currently Amended) The device of claim 54, 37, wherein the ~~device~~ compound has a structure selected from the group consisting of:

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wherein X is independently selected from hydrogen, alkyl, alkenyl, alkynyl, alkylaryl, CN, CF<sub>3</sub>, NO<sub>2</sub>, halo, aryl, heteroaryl, substituted aryl, substituted heteroaryl, or a heterocyclic group;

additionally or alternatively, any two adjacent substituted positions together form, independently, a fused 4- to 7-member cyclic group, wherein said cyclic group is cycloalkyl, cycloheteroalkyl, aryl, or heteroaryl, and wherein the 4- to 7-member cyclic group may be further substituted by substituent X;

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Z is selected from -CH<sub>2</sub>, -CRR, -NH, -NR, -O, -S, -SiR wherein R is independently selected from hydrogen, alkyl, alkenyl, alkynyl, alkylaryl, CN, CF<sub>3</sub>, NO<sub>2</sub>, halo, aryl, heteroaryl, substituted aryl, substituted heteroaryl, or a heterocyclic group; and

R<sub>9</sub> and R<sub>11</sub> are F.

56. (Original) The device of claim 37, wherein the compound is a phosphorescent emissive material.

57. (Previously Presented) The device of claim 37, wherein at least one ligand is a phosphorescent emissive ligand in the compound at room temperature and at least one ligand is not a phosphorescent emissive ligand in the compound at room temperature.

58.-63. (Canceled)

64. (Previously Presented) The device of claim 57, wherein the ligand emissive at room temperature in the compound has a triplet energy corresponding to a wavelength that is at least 80 nm greater than the wavelength corresponding to the triplet energy of the ligand that is not emissive in the compound at room temperature.

65. (Currently Amended) The device of claim 64, wherein the ~~first~~ emissive ligand is organometallic.

66. (Canceled)

67. (Currently Amended) The device of claim 64, wherein the ~~first~~ emissive ligand has a triplet energy corresponding to a wavelength of 500-520 nm.

68. (Currently Amended) The device of claim 64, wherein the ~~first~~ emissive ligand has a triplet energy corresponding to a wavelength greater than 590 nm.

69. (Previously Presented) The organic light emitting device of claim 64, wherein each ligand is organometallic.

70. (Canceled)

71. (Previously Presented) The device of claim 69, wherein the emissive ligand has a triplet energy corresponding to a wavelength of 500-520 nm.

72. (Previously Presented) The device of claim 69, wherein the emissive ligand has a triplet energy corresponding to a wavelength greater than 590 nm.

73. (Original) The device of claim 69, wherein the device is incorporated into a consumer product.



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74.-88. (Canceled)

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Previously withdrawn claims 17-19 and 53-55 set forth formulae that overlapped in scope with the formula set forth in the independent claims. These claims have been amended to overcome inconsistencies between the formulae shown in these claims and the limitations of the claims from which they depend.

Previously withdrawn claims that set forth formulae that provided no overlap in scope with the formula set forth in the independent claims (i.e. claims 23-27 and 59-63) have been canceled, and well as withdrawn claims 79-81 which depended from previously canceled claims.

In addition to the changes shown in the preceding examiner's amendment, claims 17 and 53 have been amended by deleting the third and sixth formulae of the six formulae shown in the prior version of claims 17 and 53, and claims 18 and 54 have been amending by deleting the third, fourth and fifth formulae of the five formulae shown in the prior version of claims 18 and 54. (The deleted formulae are not shown in the examiner's amendment.)

Claims 1-3, 5-21, 28, 29, 31-33, 35-39, 41-57, 64, 65, 67-69 and 71-73 are allowed. Allowed claims 1-3, 5, 6, 15-21, 28, 29, 31-33, 35, 36, 7-14, 37-39, 41, 42, 51-57, 64, 65, 67-69, 71-73 and 43-50 are renumbered as 1-55, respectively.

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Any inquiry concerning this communication should be directed to Marie R. Yamnitzky at telephone number (571) 272-1531. The examiner works a flexible schedule but can generally be reached at this number from 7:00 a.m. to 3:30 p.m. Monday-Friday.

The current fax number for all official faxes is (571) 273-8300. (Unofficial faxes to be sent directly to examiner Yamnitzky can be sent to (571) 273-1531.)

MRY

September 18, 2007



**MARIE YAMNITZKY**  
**PRIMARY EXAMINER**

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